

MM Docket No. 95-176
Closed Captioning

RECEIVED
MAR 21 '96
COMMUNICATIONS SECTION

Dear Ms. Todd:

DOCKET FILE COPY ORIGINAL

It was a pleasure speaking with you today. Here is the Email and the overview about the V+ chip I promised. Please pass it on to Linda DeBroof(sp?) or whom ever you feel appropriate. I am anxious for your opinion as to its application to the ADA act. Please call me if you have any questions and let me know if this technology could apply to ADA. I can be reached at (510) 644-1671.

The following V+ chip technology "may" be implemented by ORDER OF THE FEDERAL ADA MANDATE.

A TV, VCR or computer equipped with the new V+ chip (or after market V+ "box"), will be a tremendous help to the disabled. The consumer version of the V+ chip could be implemented "BY ORDER OF A FEDERAL MANDATE" into all consumer video equipment under the Americans with Disabilities Act of act of 1990. This same congressional act, could mandate all manufactures of televisions and VCRs to incorporate the "V+ chip" into their products within two years or risk criminal and civil repercussions.

The V+ chip is expected to follow the same track, as the captioning technology. This Federal MANDATE states that technology used to improve the disabled's lifestyle IF incorporated into consumer products. It is our opinion AND the management or the Captioning Institute that because of the highly compressed audio playback feature alone, the V+ chip product, should completely comply with ADA.

The V+ chip will add no more than \$10.00 to the cost of a TV, VCR, cable converter, or satellite receiver. The V+ chip and VideoMail+ service has the ability of automated visual and audio data delivery at the rate of 4 MEGABITS per second. At that speed, the VideoMail+ service could tremendously improve the information flow to the visually AND hearing impaired alike. The VideoMail+ services also can deliver high speed fax information and high quality audio "over the air" to standard consumer quality VCRs or TV for display or audio play back through the TV (at 300 TIMES normal transmission speed)

Sincerely,

Gary Tomlinson

No. of Copies rec'd 042
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From: <cnet@libfe.liberty.com>
To: B6.B6(stodd)
Date: 3/6/96 4:30pm
Subject: V+ chip & ADA (MS word.doc attached)

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(See

Attachment below)

*** MajorTCP/IP SMTP: There is one file attached to this message. It has been
*** automatically UUENCODED below. Total File size is 34920 bytes.
*** Number of segments: 1

*** MajorTCP/IP SMTP: This is the end of the file. This message has been
*** broken up in 1 segments.

From: <cnet@libfe.liberty.com>
To: B6.B6(stodd)
Date: 3/6/96 4:30pm
Subject: V+ chip [part 1 of 4]

Net-Casting The Information Superhighway
"Broadcasting the Internet on Television

Signals"

President Clinton has just signed the long awaited telecommunications bill. Within two years the much debated "V" chip will be mandated by the new law to be included in every new television -- Just as the Closed Captioning chip was mandated in 1990 --. The V chip is intended to block children from watching adult programming and violence on television. But that's not all it could do .

... Soon a new chip called the V+ (plus) chip could be delivering the "Information Superhighway" into every home and classroom in America. It will provide cheap, universal access to a huge over-the-air video data pipe. It will bring to fruition one of the President's main goals, made in his State of the Union Address, "To link every school in the nation to the Information Super Highway."

Like the Captioning chip, the generic V chip only "listens" to a very low speed channel carrying rating data (i.e., "R", "PG", etc.) in a small part of the television signal not visible to the viewer, called the "Vertical Blanking Interval" or VBI. The newly developed V+ (plus) chip can insert data on EVERY line of the television signal, including the VBI. The new chip performs all the functions of the previously mandated Captioning chip and the "blocking" features of the V chip. But that's not all it does. It can simultaneously deliver very high speed "video-mail" (V-mail) and "Net-casting" services --very fast delivery of Internet data on standard TV signals-- less expensively than anyone ever thought possible. It offers a far superior alternative to its predecessors and can be brought to market this year, satisfying the government's new mandate.

Within two years the new federal mandate will force manufacturers to incur enormous expenses to re-engineering their circuits to accommodate the limited Captioning and V chips. Thus consumers will pay \$5 to \$10 more per TV or VCR for the limited function chips. The question that needs to be asked is "Why not use that exact same effort and expense to fulfill the mandate with a cheap V+ chip, designed for the national information and employment needs of the 21st century?"

V+ Chip Hooks up Schools and Homes

The majority of Internet activity consists of browsing or surfing home pages that link to other Web sites. The most popular sites get hundreds of thousands of "hits" (on-line connections) per day. With so much Internet activity, net-casting entire Web sites on TV signals, to schools and hundreds of thousands of subscribers at once, makes a lot of sense. By mandating inclusion of the V+ chip in VCRs and TVs,

Internet data now chugging along at 28,800 kilobaud will be delivered at up to 3.9 MILLION bits per second (Mbs). The VCR compatible data will contain "rated" V-mail, interactive magazines, multitrack movies, constantly updated news stories, CD quality audio, radio talk show channels, hundreds of recorded talking books and a variety of voice and E-mail messages. The net-cast data are delivered 135 times faster than a phone modem, audio is delivered 300 times faster than a phone connection, and fax transmissions speed along at up to 30 pages per second.

When VCRs are equipped with the V+ chip or older VCRs are connected to a V+ chip-equipped CableModem box, they instantly become data compatible. Viewers can simply record the entire contents of top rated Web sites easier than they record a movie. And, similar to a television show, a Web site "program" can be sponsored by an advertiser's home page, which is a data commercial. Both the data packed program and the commercial have transmitted hypertext links to the rest of the Internet. By making commercials in the form of elaborate games, a viewer may interact with the commercial home page for hours, instead of watching it for only 60 seconds.

These net-casting and V-mail services will include:

- * Broadcasting of Internet "Home pages" and entire Web sites at 3.9 MILLION baud

- * Two way cable, without expensive network retrofit * VCR and computer recordable "high definition" television (digitally compressed)

- * 4 in 1 compressed "enhanced definition" television (32,000 colors) * Compressed interactive movies (9 hours per tape), talking books, magazines, voice and E-mail messages * CD quality music (over 200 hours on one VHS tape), Fax delivery (at 30 pages per second) * ANY format of CD-ROM data (up to 4x speed), encyclopedias electronic textbooks, etc. * On-demand interactive shopping catalogs and video coupons
- * Constantly updated Internet address locations, interactive yellow pages and other national directories
- * A national Law Enforcement Notification Network (Images and profiles of missing children and fugitives) * Live and recorded 2 way cable medical reference and training transmissions

Taking the Mississippi River and Fitting it into a Garden Hose

A major challenge that has always faced the Internet gurus is how to quickly deliver large files such as CD music albums, compressed video, CD-ROM data, etc., to the subscriber's PC. The top speed of a standard modem is 28.8 kbaud. Even when compressed, the file size of a short five minute sample of CD quality music can take up to one hour to download at such a low speed. To deliver compressed video and a good sounding audio track will take far longer. It's like trying to take the Mississippi river and fit it into a garden hose.

Two innovative companies have designed chips that insert data onto every line of a television signal, not just the VBI the V chip uses. Advanced Interactive of Vancouver B.C. delivers VCR recordable data at the rate of 3.9 million bits per second (Mbs) and a new startup company, En Technology offers 1.6 Mbs. By using all the TV signal bandwidth for data, they obtain enormous transmission speed and audio storage. The old reliable TV signal can now be used in a new way, quickly downloading large files that will provide everyone with full access to the Information Superhighway. Thus, any V+ chip-equipped four head VCR or computer, with just a TV, can access net-casting data from the TV signal or video tape.

Current plans call for a full functioning (2-way) "CableModem+" box, to contain both the "encoder" (upstream) and the addressable "decoder" (downstream) data chips, so it can send and receive video encoded data. For less than \$150, it can be supplied with an embedded 386 SX processor, 28.8 kbaud modem, 4 MB of RAM, keyboard, mouse, serial, parallel ports, remote control and a hard drive expansion slot. In this configuration, the V+ chip equipped CableModem+ actually functions as a limited 386 computer in its own right. It can upload, download, store and play compressed movies or any other data in real-time, without needing ANY additional hardware.

Similar to the Post Office, all net-cast V-mail is electronically addressed, before being sent to the CableModem+. The V-mail is net-cast on a regularly scheduled basis. But unlike the Post Office, it will be delivered to hundreds of thousands of subscribers at once.
[cont.]

From: <cnet@libfe.liberty.com>
To: B6.B6(stodd)
Date: 3/6/96 4:31pm
Subject: V+ chip [part 2 of 4]

[continued from part 1] All V-mail is encrypted and the video signal is scrambled, so unless it has been designated "open" or "PUBLIC DOMAIN", no one can use or view it. Even though anyone can record the V-mail data bursts "off the air", they will still need special codes or keys to unlock privately addressed packets of video data. There is a provision for EXPRESS or "near immediate" delivery of V-mail if the next day scheduled V-mail delivery is not soon enough. Like any other full functioning computer, the CableModem+ can use its own built-in

28.8 kbaud modem to dial out the traditional way, and connect to the Internet. The 28.8 kbaud modem will provide access to information that's not part of the net-cast services, or it can be used to simply "get the keys" to unlock the encryption code of live or pre-recorded net-cast data.

When smart electronic TV guide type products like Gemstar's point and click "Guide+" [Popular Electronics, Feb. '96] are teamed up with V+ chip equipped TVs, VCR recording of V-mail data will be made completely automatic. The various electronic TV Guide products can become full functioning CableModem+ receivers, providing menus on the TV screen listing the ratings and times Web site "programs" and home page commercials are to be broadcast.

A single click on the Web site's home page menu listing will bring more information about the content, or a "Web site review" is displayed by the Internet's own version of a movie critic. Also listed are reviews about television shows, movies, games etc. With just a click, parents are presented with further information about the selected Web sites programs home pages or TV shows. They then can be instantly connected to other concerned parents for discussion. By simply clicking on a TV program, game or Web site name they can instantly block their children's access to offensive broadcast. This is a very powerful way to introduce powerful new technology that might otherwise be perceived as threatening or too advanced.

A simple high-speed one way data link for downloading huge files is by far the most effective way to provide convenient access to students, novice and veteran Internet users alike.

Few applications (except video conferencing) require more than a 28.8 kbaud connection to upload information to the Internet, but there is a great demand to be able to quickly download video and other huge files from the Internet. The file transfer to the V+ chip often can wait for off-hours or "next scheduled" transmission time. The user doesn't even need to be on line. Fast, cheap and error free, delivery of VCR compatible Internet data just makes good sense for our information age.

To assist novice users, the most popular home pages can be requested by phone through a well-prompted, touchtone selected, voice mail system.

A touchtone phone keypad is "mapped" to the TV screen menus for easy substitution for the clicking functions performed by a mouse. After a home page is requested, it is automatically electronically addressed, then added to a list of other requests for that home page. Then it is delivered in a nationwide high speed video burst to every subscriber's addressable V+ chip or CableModem+ that requested the file.

New users won't have to burn up dozens of on-line hours becoming familiar with Netscape-like navigation tools. They "get their feet wet" using the extensive audiotext help system, and Guide+ type products, and soon start learning to "surf the net" without these help systems. For veteran power users that want lots of audio and video files that, even compressed, require Gigabytes of space, the CableModem+ can record up to 3.9 Gigabytes of data on a single video tape.

The CableModem+ will always check to see if there's enough space on the hard drive to download the requested data. If the drive does not have enough space the CableModem+ will direct the VCR to record the net-cast for later use (a most practical feature). In effect the CableModem+ turns the VCR into a computer's multi-gigabyte backup "tape drive", used to archive and retrieve large files. If cable TV converters or after-market CableModems are equipped with the V+ data "encoding" (upstream) option, it can even back-up the PC's hard drives to a video tape.

If the subscriber's compute hard drive hasn't enough space, or linear

VCR access takes too long, the CableModem+ can be upgraded by adding the Compressed Video Recorder (CVR) hard drive option. The CVR uses the hard drive expansion slot in the CableModem+ to allow multi-gigabyte drives to be added that will automatically "record"

hours of pre-compressed random access audio, video and data. [NOTE: Gigabyte drives now sell for under \$200.00.] As a result, users won't need to "surf the net" to use its information. They choose what they want once, from an on-screen or voice prompted menu, and it is recorded automatically on their CVR hard drive or regular VCR from then on.

Entire Website tapes could be rented at video stores. A "plug and play" CableModem+ game cartridge can provide access to a fully indexed library (3.9 Gigabytes per video tape) of favorite video games. A rented tape could also contain a compressed digitized movies, but this time they have multiple plot lines and carry both seamlessly edited "G" and "R" rated versions of the same story. A video tape containing only "compressed video" can record or play for 9 hours, not just two!

The CableModem+ optional features are enabled by these additional specialized chips and components:

- * V+ chip and Intel 3-D-X embedded 386 SX processor chip
- * Hard drive (CVR) expansion slot
- * 4 Megabytes (expandable) ram, operating system and frame capture
- * Infrared "mouse", keyboard and VCR remote controls
- * RS-232/parallel port (for a computer interface) and 28,800 baud v.34 modem chip
- * Netscape-type operating system
- * Mag-stripe card reader and scanner input ports
- * A SMPTE chip (broadcast time code reader for frame accurate control)
- * Message, FAX and data "waiting lights"
- * Two internal cable ready tuners
- * 2 telephone jacks (outbound dialing and a telephone handset input)
- * 2 video jacks (input/output) * 4 audio jacks (stereo input/output)

V+ CableModem - The Inexpensive Two-Way Highway

VCRs are ubiquitous. In the United States, 85% of all households own a VCR, a much higher percentage than have gigabyte hard drives. In addition, 67% of the households in the U.S. have cable connections. By

combining net-casting services with existing TV/VCRs and a CableModem+, the attraction of popular TV shows, news or movies form common threads of interest that are woven into a "net" that can tie entire communities of novice users together. The V+ decoder chip (down-stream) and the V+ encoder chip (up-stream) are expected to cost under \$5.00 each when mass produced. On the provider end, the current generation of Cable TV "video data frame" file servers cost under \$16,000. Along with it comes the option of the cable companies offering 2-way data over their existing cable networks, saving the enormous expense of retro-fitting "reverse amplifiers" throughout their systems. [cont.]

From: <cnet@libfe.liberty.com>
To: B6.B6(stodd)
Date: 3/6/96 4:31pm
Subject: V+ chip [part 3 of 4]

[continued from part 2] It is expected that cable TV companies will package a CableModem+ box as part of an "unlimited" Internet account. Subscribers can have their information delivered to their PC without having to "connect" to get it. This will save providers from paying for dozens of hours of 28,800 baud bandwidth. This process of "batching" together popularly requested home pages or entire Web sites for transmission, will save Internet providers exponentially over the user's 28.8 kbaud network inter-connect time. New users can polish their Internet navigation skills at home on their PC without even being on-line.

Similar to the generic V chip technology, the newly formed msNBC network is reportedly planning to insert low speed data only into the VBI. The VBI data transmission rate is expected to be only about 28.8 kilobaud. The low speed invisible data-cast will deliver msNBC's network news programs and their advertisers cumbersome "WWW//Internet.home_page.com.addresses". Also transmitted are the hypertext links that seamlessly hook the viewer's PC to the program's or commercial's Internet home page. MsNBC could use a CableModem equipped with a V+ chip, allowing it to transmit and store large quantities of high speed data directly on a hard drive or four head

VCR. The new V+ chip technology could link television viewers to the Microsoft Network's 500,000 users in ways never before possible.

Questions facing ASIC developers, CableModem manufacturers and information providers

- * How much technology can you put into a CableModem "box" or "card" and sell it for under a hundred dollars?
- * Will advertisers purchase commercial time to broadcast their "multimedia home pages?"
- * Can a dedicated "data only" Internet channel compete effectively for market share? ...How?
- * Could a "multiple plot-line" series or movie be sponsored and distributed effectively in a "data only" channel?
- * What kind of Internet services will the viewer want through a 3.9 Megabit data broadcast channel?
- * What will the applications and markets be for net-casting in Europe and the Far East?
- * Is the ability to broadcast audio in 16 languages simultaneously enough to open markets in India and China?
- * Can the V+ chip supersede the Captioning chip and V-chip and be used to satisfy the mandates?

Advertising Supported

Net-casting

An additional challenge to Web-based video providers like the Internet soap operas "The Spot" and "The East Village" is trying to get sponsorship without a television (Nielson style) rating system. This limitation will soon vanish, as Nielson is planning to rate Websites starting this year. These rating numbers can then be used to help sell advertising space within the site. When these sites can be broadcast, commercial sponsorship will become significantly easier. (NOTE: NBC just announced it will start selling expensive "interactive advertising" on the Internet [not television] at \$350,000 for six months!)

The V+ chip's video data are compatible with Direct Broadcast Satellite (DBS) systems, NTSC, PAL and SECAM video formats. By being compatible with all video formats, Internet information can be distributed in a recordable "data frame" format to an already equipped worldwide market of VCRs. These foreign video "formats" will quickly "net" novice users in other countries as well. The V+ chip's capacity to offer video with 16 simultaneous languages, sound tracks and associated

Internet data will open huge new markets in Europe and possibly the Far East. In addition to the United States, Europe, China and India are burgeoning markets for US entertainment and education (edu-tainment). Opening both domestic and overseas markets is imperative to create enough market demand to keep the retail price of a basic CableModem+ box around \$100 - \$200 (without optional hard drive).

The Intericast Industry Group (IIG) was formed as an consortium to explore these issues. So far the IIG has elected to develop a low

speed, non-recordable data format because it has to be compliant with the "old" FCC regulations and for other reasons not released as of this date. The IIG's current marketing strategies do not position their "data-cast" chip as a V chip product, even though it has many of the same functions. Their technology is designed for Intel's latest Pentium processors lines to decode NON-recordable data in a software only environment. This approach locks out the vast, international market of older computers and the 20 million+ television sets that will be required to have the new V chip technology.

The decisions made by the companies listed as participants in IIG such as America On-line, Asymetrix, Comcast, En Technology, Gateway 2000, Intel, NBC, Netscape, Packard Bell, Turner Broadcasting's CNN Interactive, QVC, Viacom and WGBH Educational Foundation carry with them the future marketability of America's entertainment, information, and the computer (Internet) literacy so necessary in the information age.

Conspicuously missing from IIG's list of "heavyweights" are other "standard setting" companies such as Cable Labs, Electronic Industry Association, General Instruments, Microsoft, and TCI. They too are faced with some hard choices as the industry starts testing "wanna-be-CableModems." Their decisions will affect billions of dollars of future U.S. information and entertainment exports, sent by satellite and cable television to V+ chip equipped computers, CableModems and VCRs.

In the last year companies like AT&T Network Systems, Digideck, General Instruments, Hybrid Networks, Intel, LANcity, Microsoft, Motorola, Tele-Communications Inc., and others have all jumped into the CableModem business. It's not surprising to find "standards issues" at the front of the CableModem debate. The above mentioned companies all have fantastic high dollar solutions that turn entire cable TV networks into very high-speed full duplex Ethernets. The expense of retro-fitting "amplifiers" from cable TV head-in to the users home to the is enormous. Even the simplest one-way data receivers are expected to cost hundreds of dollars, compared to the five dollar V+ chip. These high-end user applications have a very limited number of potential "power" users. The three questions we would like to ask the above companies are:

1.) Why is it necessary to have "high speed" data in both directions anyway? 2.) How many "power users" will need to purchase a \$400.00+ CableModem and subscribe to a high bandwidth, service to justify the expense of a system-retrofit? 3.) With the exception of 'video conferencing,' what benefits do casual and novice users get from a \$500.00 high speed, two way, cable link to the Internet, oriented around an expensive, high end computer?

A True Paradigm Shift

Just imagine . . . Sitting down and watching the news as they discuss a vital election year topic. Curious to know more? You can select from a menu on the TV screen of other "home page comments" relating to this topic.[Click] You are now listening to what Rush Limbaugh and Art Bell had to say. You [click] to unlock the November issue of Art Bell or Mike Reagan's newsletter (previously transmitted). [cont.]

From: <cnet@libfa.liberty.com>
To: B6.B6(stodd)
Date: 3/6/96 4:31pm
Subject: V+ chip (part 4 of 4)

{continued from part 3} A comment made is by Art Bell related to a story first reported in a "Barron's" article about "The Post Office's \$21 million E-mail system." Want to know more about the "Barron's" article? [click]

BARRON'S (Dec. 11, 1995): Hey, Mr. Postman . . . "Can a sleepy agency with a host of competitors find a new career in the electronic marketplace?"

The article titled "Post Script" reads, "The head of the Postal Service (Post Master General Marvin Runyon) has a plan for keeping his agency relevant: he wants his agency to be the No.1 deliverer of business E-mail. Over the past several years he has persuaded its board members to spend \$21 million to develop its own Email Project."

Now one might speculate . . . just how does the Post Office intend to deliver all those huge E-mail files? Will our computers be required to make millions of calls each day and spend hours downloading all that multimedia E-mail on-line @ 28.8 kbaud? Or will the United States Postal Service or Federal Express have their own idea of how to use the new V+ chip to deliver their own version of 3rd class (next day) "V-mail?" You know the type, that electronic "junk mail" you just told your CableModem+ to ignore. Oh, except for that "Victoria's Secret Catalogue" you're waiting for.

Now these are the most important technology issues faced in this century; and the answers will have a substantial influence on how easily other countries can distribute, update, and interact with our information, entertainment, education and news. The affects of this "paradigm shift" in information distribution will pull a "kicking and screaming" federal government into the 21st century. The mandate for a V chip . . . , or rather a V+ chip could be the single most important factor in bringing universal access to Email (see RAND report below), the Internet and computer literacy programs, so important for America to remain competitive in the new "information based" job market and economy.

We now are standing at the threshold of a TRUE paradigm shift, jumping from an industrial based economy (where we build things) to one based on information (is that news . .

..?). The V+ chip and its VCR-compatible data format is considered one of the most significant technological breakthroughs in video and broadcast television since the advent of the VCR itself. History has proven that easy access to information is as important as the information itself. Universal access to the Internet's knowledge banks and entertainment is not just a matter of convenience, it's an absolute imperative for our information age. Soon the technology to freely access and distribute information may be mandated by law. By making the right choice of basic technology, it can be done inexpensively. The President's wish can come true. Information access can be available to everyone. And the companies investing in the development of these inexpensive communications tools will leave an indelible mark on history.

(END)

RAND STUDY PROPOSES NEW NATIONAL GOAL: E-MAIL ACCESS FOR EVERY AMERICAN ANALYSIS OF SOCIAL-ECONOMIC-TECHNICAL ISSUES FIND GOAL REACHABLE, VITAL

Dateline: Washington, D.C., November 21, 1995 --Would it be feasible to make electronic mail technology as ubiquitous as telephones and television sets? Is it important to try? A two-year RAND study released today examines both of those questions and concludes that it is not only achievable but imperative.

The study proposes a national goal of access to e-mail for every American, urges development of a simple scheme for providing every U.S. resident with an e-mail address and backs up these recommendations with a comprehensive analysis of the social economic cost and benefits as well as the technical issues involved.

E-mail access is fast becoming a basic requirement for full participation in American society, according to the analysis. However, income and education gaps in access to computers and network services have widened significantly and race and age-based gaps remain substantial. As more and more social, commercial and governmental transaction take place on-line, "information haves may leave the have-nots further behind unless we make concerted efforts today to provide all citizens with access to the technology," the authors warn.

"We find that use of electronic mail is valuable for individuals, for communities, for the practice and spread of democracy, and for the general development of a viable National Information Infrastructure (NII)." Consequently, the nation should support universal access to e-mail through appropriate public and private policies.

To achieve that aim, efforts will have to run the gamut. They say the industry must find "creative ways" to make network access and use cheaper. Both the public and the private sectors should encourage computer recycling. Public policies should encourage the placement of access devices such as computers, set-top boxes and terminals in libraries, community centers, transit stations hotels, perhaps even pay phone-like at street corners. Training and outreach activities to promote access among underserved groups must be organized.

Because commercial and other advances are rapidly advancing the cause of connectivity, government's role can be circumscribed and tightly targeted, the researchers say. It should focus on setting the nation's sights on the goal of universal access, ensuring that all messaging technologies are on a level regulatory playing field, and provide for limited funding -- possibly via vouchers -- to get marginal consumers into the system.

The new study, "Universal Access to E-Mail: Feasibility and societal Implications" was funded by The Markle Foundation and is the latest in a series of major RAND contributions to the information revolution.

... Analyzing electronic environments ranging from the World Wide Web to on-line communities and interest groups, the authors invariably found e-mail at their core. "If this report demonstrates anything," they stress, "it is the importance of person-to-person and many-to-many communication. Therefore, it is critical that electronic mail be a basic service in the NII (National Information Infrastructure). To the extent that public policy guides the evolution of the U.S. NII, it should consider universal access to e-mail as a cornerstone of that policy."

Full implementation could take a decade or more, the researchers observe, but it should start with efforts to help those groups suffering the most severe and growing "deficits in access." For example, Americans in the top income quartile were six times more likely to have access to a household computer than those in the bottom quartile as of 1989, but seven times more likely by 1993.

Convenience is the single most powerful predictor of e-mail use, so priority should be given to equipping U.S. homes, the authors suggest. Efforts to bring the poor on-line need not be all that expensive. They estimate that it could be accomplished for about \$1 billion per year or less. ...

Copies of the \$20 study [267 pages] are available from RAND @ (310) 451-7002.